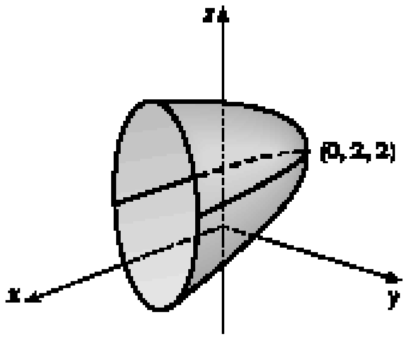
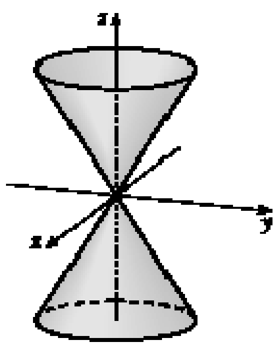
9.6: 22, 24, 26, 32, 34

22. Completing squares in y and z gives
$4(y-2)^2 + (z-2)^2 - x = 0$ or
$\frac{x}{4} = (y-2)^2 + \frac{(z-2)^2}{4}$, an elliptic paraboloid with vertex $(0, 2, 2)$ and axis the horizontal line $y = 2$, $z = 2$.

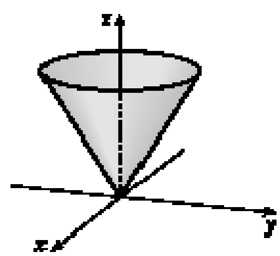


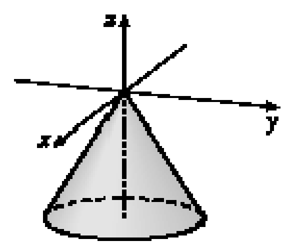
24. (a) The traces of $z^2 = x^2 + y^2$ in $x = k$ are $z^2 = y^2 + k^2$, a family of hyperbolas, as are traces in $y = k$, $z^2 = x^2 + k^2$. Traces in $z = k$ are $x^2 + y^2 = k^2$, a family of circles.

(b) The surface is a circular cone with axis the z-axis.



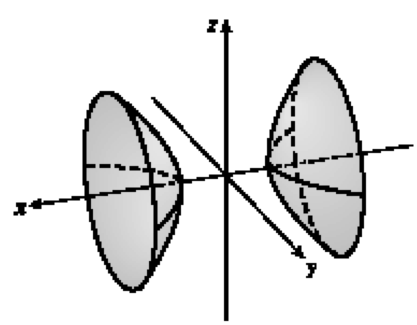
(c) The graph of $f(x, y) = \sqrt{x^2 + y^2}$ is the upper half of the cone in part (b), and the graph of $g(x, y) = -\sqrt{x^2 + y^2}$ is the lower half.





26. (a) The traces of $-x^2 - y^2 + z^2 = 1$ in $x = k$ are $-y^2 + z^2 = 1 + k^2$, a family of hyperbolas, as are the traces in $y = k$, $-x^2 + z^2 = 1 + k^2$. The traces in $z = k$ are $x^2 + y^2 = k^2 - 1$, a family of circles for $|k| > 1$. As $|k|$ increases, the radii of the circles increase; the traces are empty for $|k| < 1$. This behavior, combined with the vertical traces, gives the graph of the hyperboloid of two sheets in Table 2.

(b) The graph has the same shape as the hyperboloid in part (a) but is rotated so that its axis is the x-axis. Traces in $x = k$, $|k| > 1$, are circles, while traces in $y = k$ and $z = k$ are hyperbolas.



32. Any point on the curve of intersection must satisfy both $2x^2 + 4y^2 - 2z^2 + 6x = 2$ and $2x^2 + 4y^2 - 2z^2 - 5y = 0$. Subtracting, we get $6x + 5y = 2$, which is linear and therefore the equation of a plane. Thus the curve of intersection lies in this plane.

34. Let $P = (x, y, z)$ be an arbitrary point whose distance from the x-axis is twice its distance from the yz-plane. The distance from P to the x-axis is $\sqrt{(x-x)^2 + y^2 + z^2} = \sqrt{y^2 + z^2}$ and the distance from P to the yz-plane ($x = 0$) is $|x|/1 = |x|$. Thus $\sqrt{y^2 + z^2} = 2|x| \Leftrightarrow y^2 + z^2 = 4x^2 \Leftrightarrow x^2 = (y^2/2^2) + (z^2/2^2)$. So the surface is a right circular cone with vertex the origin and axis the x-axis.